I. C. 6793 AUGUST 1934

DEPARTMENT OF THE INTERIOR

UNITED STATES BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

A MILLION TONS OF ANTHRACITE MINED WITHOUT A FATALITY

RECEIVED

BY

R. D. CURRIE

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A MILLION TONS OF ANTHRACITE MINED WITHOUT A FATALITY1/

By R. D. Currie2/

Introduction

A million tons of coal mined in the Pennsylvania anthracite region without a fatality is a feat of which to be proud and one that deserves the commendation of the entire mining industry. The average production per fatality in this region for 1933 was 200,828 tons, an exceptional record showing the results of an intensive drive made by the Pennsylvania Department of Mines and the anthracite operators and workers to curtail the high accident rates heretofore prevailing in the region.

This paper gives information about a mine with a record five times better than the average which should prove to the industry that mine accidents can be reduced through the proper safety organization and effort. The Pine Hill Coal Co., managed by Weston Dodson & Co., Inc., and located at Minersville, Schuylkill County, Pa., has made such a record at its Oak Hill colliery by studying its accident experience, realizing the facts, and pursuing a definite safety policy with a view to bettering its accident occurrence.

As a direct result of its safety policy this colliery has produced 1,044,000 tons of anthracite without a fatality; within 3 years it has reduced its total accidents from 645 to 105 per year, its compensable accidents from 204 to 45 per year, and its lost-time accidents from 335 to 67 per year. In addition, it has set up a smoothly functioning safety organization that will go far in aiding in the continuance of this great work of mining anthracite at a lower cost in human suffering.

This circular describes the accident-prevention methods perfected and the results obtained by this colliery in the belief that similar methods will produce essentially similar results at any other colliery where they may be adopted.

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S.Bureau of Mines Information Circular 6793".

2/ Engineer in charge, Scranton (Pa.) Safety Station of the U.S.Bureau of Mines.

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Acknowledgments

The writer acknowledges his indebtedness to the officials of the company who furnished him with the details of the safety organization and the data from which this report was prepared. He especially desires to thank Messrs. Stockett, general manager, Wells, general superintendent, Morgan, safety engineer, and Kistler, statistical department, for their kind assistance.

Type of Colliery

The mine is opened by shafts, slopes, and drifts, a characteristic of mines in the Southern anthracite field. Thirteen different beds of coal are being mined. The thickness of the beds ranges from 3.5 to 16 feet and the pitch from 0 to 90°. The roof and floor exhibit the entire range of conditions found in anthracite mines. Table 1 describes the coal seams being worked.

TABLE 1.- Coal seams mined at Oak Hill

Name	Average thickness, feet	Description
Tracy	6	Fair, slabby, slate roof.
Little Diamond	4.5 - 5	Hard slate roof which weathers poorly.
Diamond	8	Sharp, slaty top; heavy fire-clay bottom.
Little Orchard	3.5	Soft, friable top, fair bottom.
Orchard	4 - 6	Heavy middle stone, soft near the top; soft, friable roof and fair bottom.
Primrose	7 - 13	Blocky, heavy coal; good top, good bottom.
Holmes	6.5	In two benches - bottom bench 4.5 feet with 2 feet of middle stone and 2 feet of top coal. Middle stone is timbered.
Four Foot	4	Excellent top; soft bottom, of shelly slate.
White Ash	12 - 13	Free-running from face; fair top, good bottom.
Red Ash	0 - 14	Shaly top.
Black Heath	8 - 16	Hard top - sandstone and conglomerate; gas pressure in lower levels causes pieces to fly from the face.
Skidmore	5	Good top, good bottom; hard coal.
Seven Foot	0 - 8	Good top, slaty bottom.
Buck Mountain	8	Excellent conglomerate, top and bottom; laminated with 2 bands.
Little Buck or Ridge		Laminated veins, with 3 bands.

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Safety Organization

In October 1931, after completing a study of safety organizations in other mining fields, the Pine Hill Coal Co. selected what appeared to be the better practices for its purposes and adapted them to its own use.

The following report, written by B. H. Stockett on October 22, 1931, gives the details of the inception and functions of this safety organization:

RECOMMENDED ACCIDENT PREVENTION WORK
FOR
WESTON DODSON & COMPANY, INC., MANAGED PROPERTIES

Adopted October, 1931

In order to reduce the excessive number of accidents which have been occurring, particularly at the Pine Hill Coal Company's collieries, and in an endeavor to reduce those of the Locust Mountain Coal Company, plans have been considered to make a special drive toward this end. After reviewing a number of plans, we find that the accident prevention work of the Phelps Dodge Corporation, as outlined on page 345 of the Mining Congress Journal of July, 1931, fits in with our operations exceptionally well, with some modifications. The plan as suggested for our conditions will be handled by the following committees:

A. Corporation Safety Committee
B. General Safety Committee
C. Operating Safety Committee

The personnel and function of these committees are outlined below:

CORPORATION SAFETY COMMITTEE — This committee will consist of Messrs. T. M. Dodson, A. G. Dodson, B. H. Stockett, Chairman, J. D. Lewis and W. B. Wells.

This committee will be responsible for the successful conduct of the meetings will be held four times a year and will be so arranged that the committee will visit and inspect the safety work of the companies. At these meetings the accident records of the coal companies will be reviewed and discussed, methods for improving practice, stimulating interest and new innovations will be studied.

It is believed that with this committee a definite and uniform safety policy can be developed, methods and practice at the mines standardized and efforts directed to a definite objective.

GENERAL SAFETY COMMITTEE — This committee will consist of the General Manager, who will be Chairman, the Safety Engineer, Secretary; the Superintendent of the Colliery, Vice Chairman; and the department heads of the mine, viz., Mine Foreman, Outside

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Foreman, Breaker Foreman, Master Mechanic and Chief Electrician.

This committee will be responsible for the proper administration of accident prevention work of the company. Meetings will be held monthly, at which time the plant accident record will be reviewed, safety recommendations and suggestions acted upon, methods for improving the work discussed, and special hazards and existing practices studied, with the idea that the necessary changes will be made in the present practices, where economy will permit.

OPERATING SAFETY COMMITTEE — This committee will consist of the Superintendent, who will be Chairman of the committee; the Safety Engineer, who will be Secretary of this committee as well as of the General Safety Committee; three to five workmen appointed to serve for three months, together with an equal number of foremen or bosses to serve for the same period of time.

The chief function of this committee is to bring the workmen in direct contact with the work and thus secure their cooperation. Meetings will be held monthly, at which time the accident record will be reviewed, accidents which have occurred will be discussed and classified, hazards, practices and working conditions will be studied. This committee will also make inspections of the collieries to study the operating practices and conditions.

One of the functions of this committee is to discuss and formulate safety rules and regulations and to establish penalties for their violation. It is generally conceded that men will obey rules they have helped to formulate with better grace, and are less resentful of penalties, enforced for the violation of such rules, than where the rules are forced upon them by those in authority.

The Safety Engineer will compile all accident reports and statistics, with the aid of the Mines Accounting Department. He will also personally investigate every lost-time accident which occurs and render an independent report covering the same. He will make frequent safety inspections to study existing practice and special hazards and recommend new methods of practices for improving the work.

The accident reports will continue to be compiled as they are at the present time. However, while all accidents will be reviewed, the lost-time accidents will be the basis of compiling records for the various foremen and their sections. The number of lost-time accidents and the total shifts worked by each section is suggested as the method of measuring frequency results, the accident rate being expressed in "accidents per 1,000 shifts worked". All accidents which result in the loss of time to the injured employee are included in the comparative accident reports.

It is suggested that the following accident reports be compiled each month:

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A. Lost-time accidents.

B. Record of departmental lost-time accidents.

In this report the accident record of each department will be shown under the following departmental headings:- Mines, outside, breaker, mechanical (including carpenters, other than those assigned to permanent work as in the breaker) and the total record. The information is shown under the following headings:

1. Number of lost-time accidents for month.
2. Accident rate per 1,000 shifts worked for the month.
3. Number of lost-time accidents year to date.
4. Accident rate per 1,000 shifts worked year to date.

C. Classification of accidents.

This report records the fatal, serious and slight accidents of each department or section. It also indicates the accident rate in each classification per 1,000 shifts worked. The accidents for each department or section are classified as follows:

1. Fault of injured employee.
2. Fault of fellow employee.
3. Fault of direct supervision.
4. Fault of indirect supervision.
5. Fault of tools or equipment.
6. Trade risk.

D. Record of employees of each foreman and fireboss.

E. Classification of accidents as to cause.

This report records lost-time accidents as to cause, such as fall of roof, fall of persons, electricity, etc. The definition of a lost-time accident is, any accident which prevents an employee from returning to his regular occupation on the day following the accident.

The foregoing outline may require some modification from time to time, but is generally applicable to our work.

As the first step forward, we believe we must have intensive training of our foremen and make them safety conscious or safety minded. SAFETY FIRST and not SAFETY SECOND. We propose in order to work this about, to start with a weekly school for foremen, starting on Wednesday, October the 28th. It will be necessary to have the day shift foremen attend in the evening, the night shift foremen at noon and the outside foremen in the evening before or following the inside foremen. With the

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intensive schooling of our men, considerable improvement can be secured.

In addition to the above, we believe it will be necessary to have numerous charts compiled, safety signs painted, the property cleaned up, inside and outside, and a bulletin board for each fireboss' section, upon which can be posted weekly the performance of his section. It will also be necessary to have one on the outside showing the comparative record of each foreman.

As immediate steps, the cleaning-up is going forward, we are arranging to paint our locomotives, which are constantly before the men, with Pine Hill Coal Company, the number and SAFETY FIRST. It may also be worth while to put various slogans on mine cars from time to time, as they travel all over the mines.

As part of this report, the article outlining the Phelps Dodge plan is attached.

This program was adopted by the company and with a few minor changes is the basis of the present safety organization at its Oak Hill colliery. Thus, we find a safety plan, which under a progressive mining company has proved successful in the copper mines of Arizona and the bituminous-coal mines of New Mexico, proving successful in the anthracite region of Pennsylvania.

Safety Code

A set of safety rules was formulated by the operating safety committee to supplement the anthracite mining law, which is the prime safety code of the region. This set of rules was published in booklets and distributed to the officials and employees of the company. Although short and to the point it covers the safety conduct of the employees from the time they get up in the morning until they return to their homes in the evening. The complete safety code follows:

PINE HILL COAL COMPANY

A

SAFETY CODE

FOR YOUR PERSONAL PROTECTION

January, 1932.

DODSON SAFETY CODE

I. - On your way to and from work:

1. Start early enough so that you will not have to hurry - this applies particularly to those using automobiles. The folks at home can help you follow this advice by waking you, by having your breakfast ready, and by getting your bucket packed on time.

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2. Even though you may be young, don't wrestle or engage in horse-play with others either on the surface or underground. A great many accidents have been caused by slipping and falling.

3. If arrangements are made for your transportation in shaft, slope, or plane, the speed of travel must not exceed 900 feet per minute. When a cage load of men is moving in a shaft, the safety chains must be in place; and when a trip on slope or plane is in motion, you must remain seated. Only 10 men are allowed on a cage or in a man car.

4. When walking underground, be careful of the trolley wire and electric feed lines. In particular, don't carry a drill or similar tool on your shoulder; carry it in your hand, forward and dipped down. This rule has two purposes; to prevent yourself or the tool from touching the trolley wire with the possible danger of your electrocution and to avoid having some one in the dark run against the point of the tool.

5. Be sure to report your arrival for work to the boss in charge. This is particularly necessary in the case of miners, who must not enter their working place without ascertaining the result of the fireboss' inspection thereof.

6. If your work is located underground, don't carry matches, lighters or smoking materials. This is a State Law.

7. Be sure to know the secondary traveling ways - marked with large white arrow - leading outside from your section of the mines, so that in case of an emergency you could escape to safety.

8. If you use the wash-house after work, be sure to avoid colds by dressing warmly as you come out into wintry weather. Be careful of automobiles on your way home.

II. - Safeguards against roof falls:

9. Never go under bad top anywhere. If it is in your working place, bar it down or secure it with timber. If it is on a haulage or traveling way, report it to the foreman. The most serious danger to you in mining is from falls of roof. Your best safeguard is everlasting carefulness.

10. If you are a miner, always make a careful examination of the roof in your working place when you enter at the beginning of the shift and when you return to the face after each shot. You are solely responsible for this by State Law.

11. Be extremely careful when barring down loose roof. Of course you should not stand under the piece on which you are barring.

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Just as important, you should test carefully the piece immediately over where you are standing to avoid the possibility of its falling at the same time as the piece on which you are barring. It is better to use a bar than a pick in bringing down loose roof; but if you use a pick, always pull on the handle - never push. Because if you push, you might slip forward under the bad roof just at the instant that it falls.

12. Properly placed and correctly stood props and timber sets are your best safeguard against personal injury and are a monument to your skill as a workman. Always place your orders for timber early so that you will have sufficient on hand for any emergency. If your orders are not filled promptly, tell the foreman about it.

13. You can prevent much of the danger from roof falls and will avoid a lot of unnecessary work and expense to yourself by using good judgment in the placing of your shots. Contrary to the opinion held by some mining men, the force exerted by an explosion in a drill hole is equal in all directions. If you do not give your shot a good "chance", and if you overcharge the hole, the resulting poor placing causes a bad shattering of the roof, which may later cause you a lot of trouble and considerable danger.

III. - Guarding against transportation accidents:

14. Always keep in mind that haulage roads are designed primarily for the passage of cars and that men walking do not have the right of way. Therefore, obey the old familiar sign "STOP-LOCK-LISTEN" before crossing mine or railroad tracks inside or outside the mine; never go up or down a slope or a plane without having first arranged for a clear road by telephoning the engineer; and be very careful that no trips can overtake you if you are traveling on a level roadway. Never do any more walking about the mine than is required by your specific work; and never steal a ride. Never ride a motor or trip.

15. If your work has to do with the transportation of cars, always do it the safe way and don't take a chance. For example: you know full well that it is dangerous and against the State Law to couple or uncouple cars when they are in motion. Don't do it. Also it is safer when coupling cars on a curved track to stand on the outside rather than on the inside of the curve. Never "scotch" a car with anything but a regular scotch having 12 inch handle extending at right angles to the travel of the car. Otherwise, use a sprag as a sprag. Always place a tail light on the rear of any trip of cars to be moved, both as a warning to others and to let it be known at destination that the trip has not parted along the road. If you are operating an electric locomotive, be sure that you can rely on the brakes and that the

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headlights and gong are in good condition. Patchers must ride in a secure place on the motor or last car of the trip.

16. In addition to the careful handling of cars, there are a number of other things to which attention must be given in order to eliminate transportation accidents.

    (a) The roadbed, tracks and running gear of cars and motors must be maintained in good condition.

    (b) The timbering must be adequate and must give proper clearance.

    (c) The roof must be trimmed of all loose pieces to prevent falls and the possibility of derailments.

    (d) Loose material, such as fallen rock and coal, extra rails, ties, pipe, props, timbers, etc., should not be strewn carelessly along haulage roads in such a manner as to cramp clearances. They should be carefully piled at designated places where storage space is adequate, and with clearances of 42" from the rail in the mines and 48" from the rail on the outside; or else, if not retained for future use, they should be loaded out of the mine at once.

17. If a mine car has jumped the track, the safest way to get it back on the rails is to use "retrackers". If it is necessary to use jacks or levers, be very careful to secure the blocking, because many accidents have been caused by slipping of the blocking. As soon as you have rerailed the car, use your best judgment in determining the cause of the wreck; if the car was at fault, send it to the shop; if the track was bad, report it to the forman. In other words, use that experience to prevent another accident.

IV - The safe use of explosives:

18. Your personal safety in the use of explosives is a matter that is almost wholly in your hands. The company has placed on sale at this colliery explosives which have passed the rigid Government requirements in the matter of safety, and which after exhaustive tests have been found to be best fitted for our conditions. Your orders are honored at the powder house, and deliveries of the ordered explosives are made for your convenience to the foot of the shaft. It is therefore, up to you to use them properly and thereby avoid exceedingly painful injuries.

19. Store your explosives in a covered wooden box at least 100 feet from the face. Arrange matters so that metal tools cannot come in contact with explosives. Store the detonators in a separate place from the explosives.

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20. Make sure that your drill bit is sufficiently large to allow the cartridge free entrance into the drill hole; clean out the hole carefully before inserting the explosive; tamp the hole full, using a wooden tamping stick.

21. Always use an approved battery to set off explosives. Before you connect the shot-firing wires to the battery, give ample warning to other workmen that you are going to fire. If you are about to hole through into another opening, be sure to get an answer to your warning from the other workmen. After the shot, immediately disconnect the shot-firing wires from the battery and twist the two ends together.

22. Allow sufficient time after firing for the smoke to clear before you return to the face. When you do return, immediately test for gas and for loosened roof, face, and ribs. Remember that the conditions of your working place are likely to have been entirely changed as a result of your blasting.

23. Please reread the paragraph above numbered 13. Experience has clearly shown that the proper placing of your shots is of prime importance to your safety.

24. In case of a missed fire, drill a new hole in such a manner that it will not come in contact with the explosive in the original hole, and charge this second hole lightly. A missed fire should never be drilled out. After the firing of this second hole, be sure to determine whether or not the original hole was detonated by the blasting of the second hole. If in your judgment the original charge was not exploded, notify the foreman and arrange for a careful examination of the shot coal to recover the detonator and all lose sticks of explosives.

V - Safeguards for work with tools and around machinery:

25. Keep your tools in good condition. Avoid using any tool if the handle is broken, or if the handle is not securely keyed into the head, or if the head is mushroomed. Don't leave tools lying about carelessly; because they may cause injury to others, or they may be lost.

26. The company aims to enclose within guards the moving parts of all stationary machines so that it will be impossible for a workman to be injured. However, many of these guards must be removable to permit repairs. Therefore, after the repairs have been made, be sure to replace the guards before starting up the machine. If you can suggest an improvement which will make any guard more efficient, or if you see any danger which is not now guarded, be sure to discuss the matter with the foreman.

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27. Fashion very definitely states what women must wear to be stylish. It should speak just as positively on the subject of what workmen should wear to be safe. Be sure that your clothing is not torn and that it is not loose enough to catch in things. Wear goggles to protect your eyes. The use of protective hats and even of hard-toed shoes has prevented countless accidents from resulting in bodily injuries. Gloves should be worn in certain work, and gloves without guantlets are the safest.

VI. The safe handling of material:

28. Most accidents in this class occur in one of these ways: -

(a) You may stumble or fall, which is apt to injure or strain you because the weight you are handling falls with and possibly on you; or

(b) The material may slip out of your control and injure you or others as it falls; or

(c) The floor, a ladder, a scaffold, a box, or an insecure blocking on which you are standing may give way under the combined weight of yourself and the material you are handling and drop both you and that material with painful injury to yourself. It certainly behooves you to be careful and avoid these accidents.

29. If you are a breast miner, be sure to keep the handholds and footholds in your manway in a secure condition so that you will be able to carry timber, etc., up to the face safely.

30. If you are putting up a set of timber, be careful not to let either the legs or the collar slip and injure you; also if you have to stand on blocking, make sure that it is secure.

31. If you are handling material in a building with several stories (like a breaker), be very careful not to let any of the material fall to the floor below and thus endanger others. Also don't throw material out of any windows unless there is a positively protected area below for its reception.

VII. Safety in ventilation:

32. The burden of supplying adequate ventilation to dilute noxious gasses and to give you an ample supply of fresh air is largely a problem resting on the shoulders of the management. But there are several things which you can do, both for your own advantage and to assist the general ventilation.

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33. Always leave doors and regulators exactly as you found them. If you note anything that seems to be wrong (like a door blocked open when you think it should be closed) report it immediately to the foreman; but don't change it on your own responsibility.

34. If you are a miner, drive the heading sufficiently large for the passage of air; always maintain the topmost one free of loose material; and don't pile or store anything in a blind heading. Never stay in a blind heading. We had a man killed doing this. See that the stoppers are built securely and airtight. If brattice is required from the top heading to the face, maintain it efficiently.

35. If you are a miner, you should always get a flame safety lamp at the lamp house before entering the mine. Use it frequently and always keep it lighted. Keep light at face when working there. You should test for gas immediately as you enter your working place at the beginning of each shift, and also just before and after firing. If you find gas, report it to the fireboss.

VIII. Safety in General:

36. Nearly 3,000 years ago a Rabbi in the Holy Land wrote on parchment a treatise in which he listed progressively the six virtues which a man must attain before he can reach Godliness; and the sixth virtue he said was "Cleanliness". It is from that treatise that we get the well-known expression "Cleanliness is next to Godliness". In our Safety Campaign, the next important consideration both for you and for the company is Cleanliness. We certainly cannot attain safety if we fail to clean up. And if we do a good job in our clean-up, we very probably will find that we have at once arrived at our goal of safety.

Here is a proposition on which you and the company can join with mutual advantage. The company will look after the clean-up and the keeping clean of the outside yards, the shaft bottoms and the haulage roads; you maintain a tidy working place, whether that be a breast, a gangway, a monkey, an engine room, a pump room, a store room, or a shop.

Safe Practices

In addition to a safety committee or committees, and a book of safety rules, it is necessary to establish a definite set of safe practices if accidents are to be averted and the benefits of a safety organization realized. To this end a number of excellent safe practices were established at the Oak Hill colliery after they had proved feasible and advantageous in accident prevention. Some of these were more difficult to initiate, while others were relatively easy, but all of them have proved their worth and have become a part of the accident prevention program. A few of these

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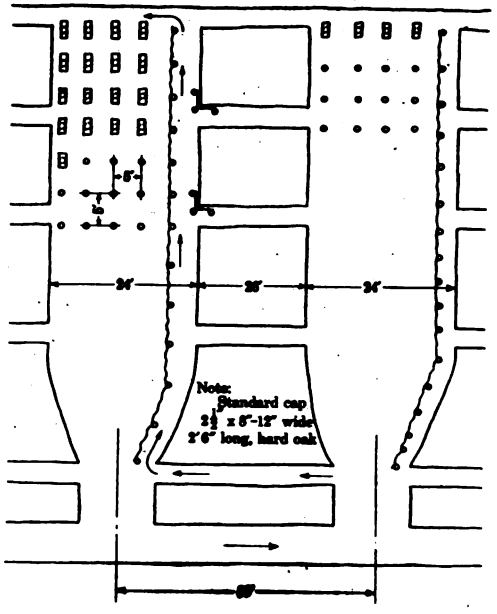

Figure 1.—Standard timbering for breasts, Oak Hill Colliery; centers will range from 4 to 6 feet across the breast and up the pitch.

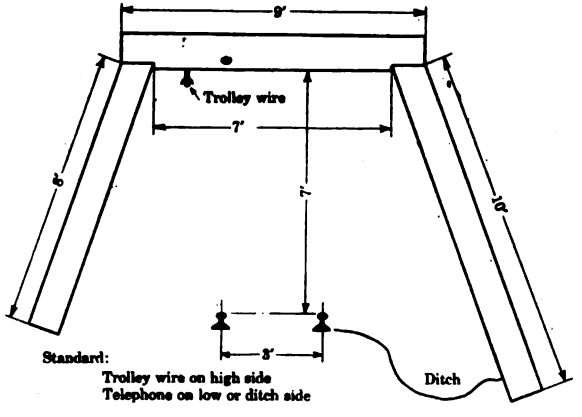

Figure 2.—Standard gangway timber.

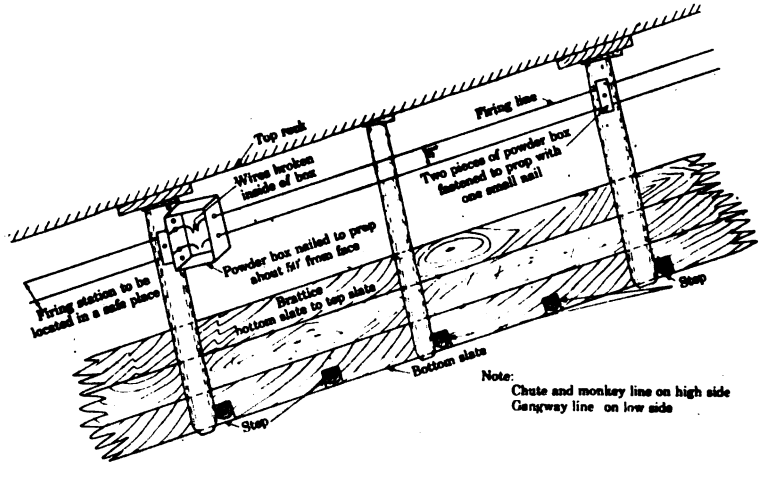
Top rock
Wires broken inside of box
Firing line
Two pieces of powder box fastened to prop with one small nail
Powder box nailed to prop about 5½' from face
Firing station to be located in a safe place
Battice
Bottom slats to top slats
Stop
Bottom slats
Stop
Note:
Chute and monkey line on high side
Gangway line on low side

Figure 3.—Standard method of installing firing line for gangways, chutes, and breasts.

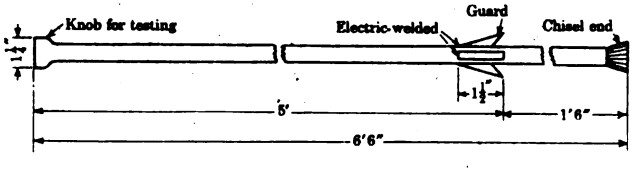

Figure 4.—Roof bar with hand guard.

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safe practices are:

1. A standard method of timbering.
2. Permissible electric cap lamps throughout the mine.
3. No smoking or smokers' articles in any part of the mine.
4. One hundred percent wearing protective hats or caps.
5. One hundred percent wearing goggles, from the entrance of the mine until the exit of the workmen at the end of the shift.
6. Permissible explosives fired electrically.
7. A standard method of installing shot-firing lines.
8. Every man "pegging in" at the fireboss' station.
9. Fire-boss safety gates at fireboss' station.
10. Standard tool for and method of testing roof and barring it down.
11. A thorough investigation and study of every lost-time accident.

At least three of these practices are unique in this region and deserve further comment.

A standard method of timbering, which designates the minimum amount and placement of the timber for a given type of working place, has been found practical and essential for the safe and economical mining of coal in every mining region of the United States by companies making a thorough study of the situation and willing to be governed by the facts in the case. The Pine Hill Coal Co. proved to its satisfaction that a standard system of timbering was applicable to the Oak Hill colliery and adopted one that met the conditions. This standard system (see fig. 1) is the minimum that may be used, regardless of roof conditions, in any working place in this mine. Under conditions of heavy or bad roof additional timbers are required as designated by the foreman or at the discretion of the miner. A standard system of gangway timbering (see fig. 2) has also been established.

The second practice, unique in this region, is that of having the men wear goggles from the time they get on the cage to enter the mine until they step off the cage at the end of the shift. Wearing goggles for eye protection has long been recognized as essential in many industries, and wearing them throughout the shift is required in many industrial plants. Miners, however, generally have been considered free lances, and compulsory wearing of any uniform type of equipment or clothing is a recent innovation. Undoubtedly it started with the use of permissible electric cap lamps, followed by protective hats, shoes, gloves, and goggles. The results of this practice at Oak Hill colliery are indicated (see chart 4) in a striking manner by the reduction in the number of eye injuries from 68 in 1931 to 9 in 1933; 8 of the 9 injuries can be accounted for by infractions of the safety standard; in the other case use of goggles prevented a serious eye injury.

The third standard practice that deserves special mention is the uniform method of installing shot-firing lines. Even with the extremely unsafe conditions prevailing generally in anthracite mines where the miners fire their own shots, it is universally agreed that electric firing is safer than firing by "fuse and caps". However, many hazards have been carried

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into practice through lack of regulations for firing, especially with regard to the installation and care of the firing lines. The Pine Hill Coal Co. has foreseen these hazards and has established a standard for installing shot-firing lines as shown in figure 3.

The standard tool used for testing and barring down loose roof is a bar equipped with a guard to prevent hand injuries while barring down loose top (see fig. 4). At the time of writing this report over 90 percent of the bars in the mine were equipped with this guard which is welded on the bar in the company's shop.

The fireboss' safety gate (see fig. 5) is dropped in place by the fireboss when he enters his section on the preshift examination. Men are prohibited from entering the section when the gate is down.

Safety Education

In addition to the weekly training school for foremen established in the original set-up of the safety organization and maintained to date safety education has been aided by home-made posters and by bulletins from two commercial sources which offer a daily change of bulletins for the main bulletin board. A new educational venture, which has proved of real merit, is a moving picture made at the colliery with local talent and local color. Keen interest in the showing of this picture has been reported. Safety subjects are discussed at general safety meetings, and moving pictures from the United States Bureau of Mines film library are shown.

To further the safety educational program this company is now perfecting arrangements for training 100 percent of its employees in the standard first-aid course prescribed by the United States Bureau of Mines. Not one first-aid-trained men employed at this mine has been on the accident list, indicating that such knowledge makes a man more careful in his work; the company therefore feels that training all of its employees in this course will cause further reduction in accidents during the next year, with the added advantage that every man so trained will be capable of giving assistance in case of accident.

Discipline

Strict discipline, in its fullest sense, is an important aspect of the safety work at this colliery. Although all employees of the company are familiar with the requirements of the mining law and the company safety code, a verbal warning or reprimand is the only punishment for the first two offences, except that in certain infractions of the mining law, where the lives of others have been jeopardized by willful violation, the offending employee is summarily discharged. In case of violation of the majority of the safety standards, rules, or laws, the third offence is punishable by a lay-off of 2 days to a week and the fourth by dismissal.

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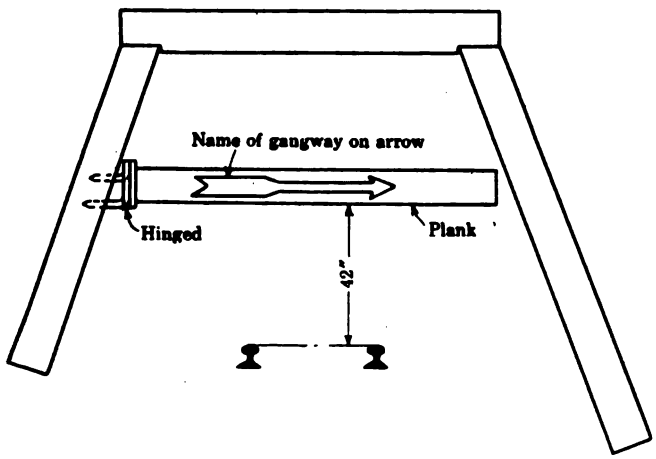

Figure 5.—Fireboss' safety gate.

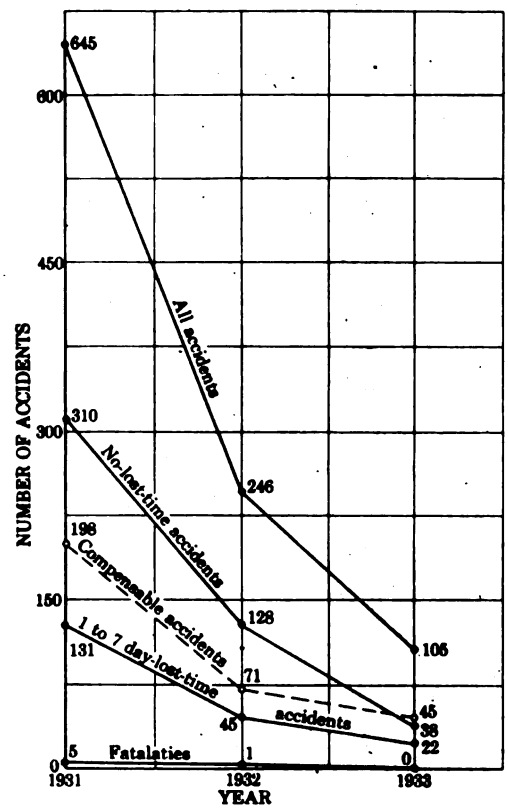

Figure 6.—Trend of accidents, 3-year period, Pine Hill Coal Co.

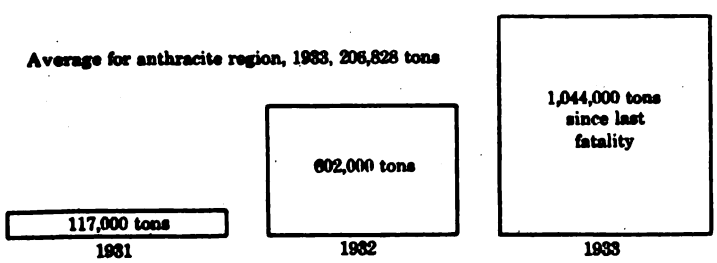

Figure 7.—Production per fatality, 1931-33.

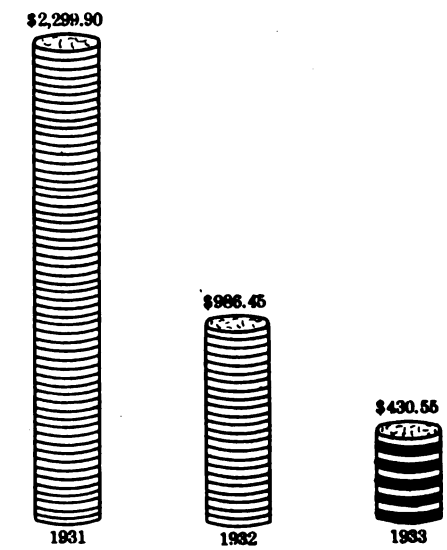

Figure 8.—Wages lost in noncompensable accidents, 1931-33.

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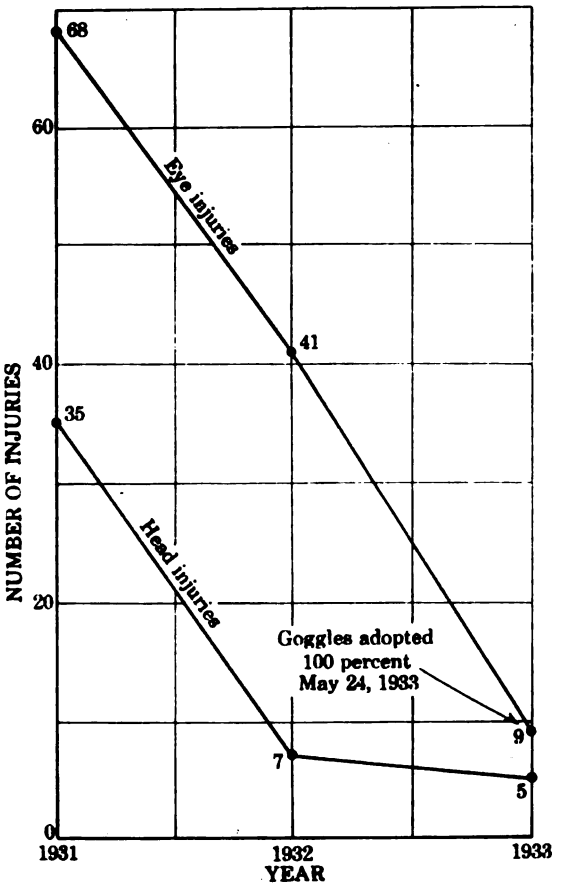

Figure 9.—Trend of injuries to head and eyes, 1931-33.

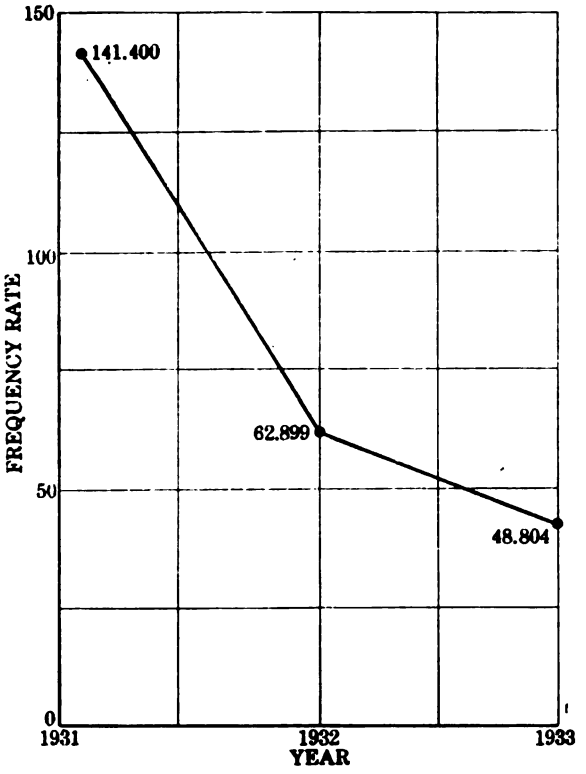

Figure 10.—Accident-frequency rates, 1931-33. (Number of lost-time accidents per million man-hours worked.)

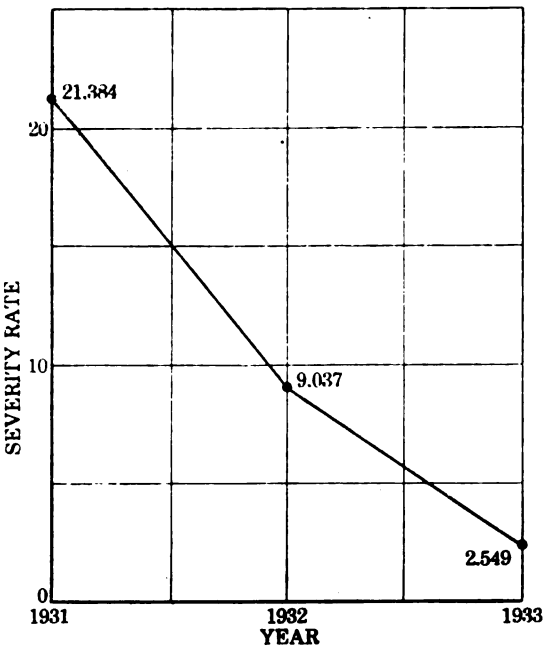

Figure 11.—Accident-severity rate, 1931-33. (Number of days lost time from injuries per thousand man-hours worked.)

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Responsibility for Accidents

The officials of the Pine Hill Coal Co. realize clearly that most accidents are caused and do not just happen. In every investigation the cause of the accident, as well as the cause of the injury, is sought and the responsibility placed; in more cases than would be suspected the responsibility for an accident is placed squarely on the shoulders of the company. In every such case the men concerned are given to understand that the company acknowledges its responsibility and that immediate steps will be taken to rectify the cause. This is an unusual procedure, but it reacts pleasantly on the employees, who realize that the blame for all accidents is not being saddled on them.

First-Aid Stations and Hospitals

The Oak Hill colliery is well-equipped with emergency facilities. There are four underground hospitals equipped with the usual first-aid appliances and supplied with heat and water. In addition there are 18 canister-type first-aid stations, consisting of a large canister fitted with blankets, stretcher, splints, bandages, and a 5-gallon brass water canteen fitted with shoulder straps by which it can be easily carried to the scene of an accident. By this arrangement the injured receive the proper first-aid treatment before being carried any distance and thus are benefitted to the greatest extent by the treatment. These canisters are easily moved as the mine workings progress and kept at points readily available in case of injury.

A registered graduate nurse employed by the company is on duty at the surface hospital or first-aid station during working hours. The company doctor maintains an office in Minersville, and hospital facilities are available at Pottsville about 5 miles from the mine.

A dispatcher system, with telephones interconnected throughout the mine and with the Bell telephone system on the surface, assures complete coordination of facilities for the prompt removal of an injured employee from the mine to the surface receiving room and to the hospital if necessary.

Accident Records and Statistics

The final proof of failure or success of any safety organization is indicated by the trend of accident rates over a period of years. Spasmodic increases or decreases in accident rates may be attributed to a number of causes; but if the general trend of accident rates is in the right direction and progressing uniformly, other conditions remaining the same, it can be conceded that the safety organization is proving successful.

A study of accident rates at the Oak Hill colliery indicates that although the ultimate goal of accident elimination has not been reached it is being approached and the safety organization has proved successful.

Figures 6 to 11, inclusive, show graphically the accomplishment in accident reduction, based on the various aspects that must be considered in calculating results of this type. The figures from which these graphs were plotted are given on each chart for easier inspection and comparison.

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It must be very gratifying to any group of mine officials to keep in touch with the results of its efforts when real progress is as strikingly demonstrated as it is in the case of this organization.

This mine was given national recognition because of its outstanding safety performance when the Joseph A. Holmes Safety Association at its annual meeting in Washington, D. C., March 5, 1934, made the following award:

> For operating without a fatality from January 12, 1932 to February 28, 1934 (and continuing), in the production of 1,147,146 commercial net tons of coal from 15 beds, 3-1/2 to 13 feet thick on pitch from flat to vertical averaging 35 degrees. 750 employees, 550 underground, worked 3,485,008 man-hours.

Conclusions

The Pine Hill Coal Co. has proved that -

1. A safety organization suitable to one type of mining can by making proper adjustments be adapted successful to an entirely different type.

2. The proper safety organization, with a definite safety policy, will be very likely to get results in accident prevention in anthracite mines.

3. Anthracite mine accidents can be reduced.

4. Over a million tons of anthracite can be produced without a fatality.

5. A standard method of timbering anthracite mine workings is more economical and safer than haphazard methods.

6. To assure the greatest protection to the workmen, goggles should be worn throughout the shift.

Unquestionably the results obtained by this company in accident prevention are the consequence of hard work and earnest effort on the part of everyone concerned. Many other anthracite companies are putting forth much effort to try to achieve safety in operation, and the reason they are not achieving success probably indicates that their efforts are not being directed along the right line; however, numerous instances are at hand indicating that apparent failure to secure safety of operation in mines, even after much effort (and sometimes much money) has been expended, has been changed to success beyond original expectation by making some seemingly trivial alteration in procedure. Undoubtedly other anthracite mines will come forward in the near future with safety records as excellent as that of the Oak Hill mine and equally unquestionably the time is not far distant when the anthracite industry will have a safety record on a par with any other branch of mining.

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